Andrey Vdovenko • June 10, 2022

# **Thermonuclear explosion of national prosperity.** How the USSR used atomic bombs in industry and what came of it

**The Cold War opponents used nuclear energy not only for destruction and intimidation. They also sought to develop the economy with its help. It was not limited to nuclear power plants alone; nuclear charges were also used for the sake of the prosperity of the motherland. Andrey Vdovenko tells us what came of it.**



## Nuclear explosions for economic needs

In the early 1960s, it became clear that it was necessary to somehow limit, if not the accumulation, then at least the use of nuclear weapons. Including their numerous tests. Thus, from 1945 to 1963, the USA, USSR, Great Britain and France conducted more than 300 test explosions. Because of them, many radioactive particles harmful to the body entered the atmosphere and the World Ocean. Radioactive fallout sometimes fell thousands of kilometers from the site of nuclear tests.

That's why the international Treaty Banning Nuclear Weapons Tests **in the Air, Water, and Outer Space** was signed in 1963. It was a big step toward nuclear disarmament and protecting the planet from radioactive contamination. However, the treaty had a small loophole. It did not prohibit **underground** testing .

**Nuclear powers, primarily the USSR and the USA, actively used this exception and tested atomic bombs in the Earth's crust. Moreover, the matter was not limited to military exercises and tests.**

### Thus, some of the most controversial experiments were those involving nuclear explosions for economic

**purposes.**

By the early 1960s, the idea of using the energy of an atomic explosion for peaceful purposes was not new. It was first voiced during the work of American scientists on the Manhattan Project. In 1957, the United States moved from words to action and launched Operation Plowshare. Nuclear scientists from the United States began conducting underground explosions to see if they could be used for industrial and economic needs.

Later, the status of peaceful nuclear explosions was enshrined in international documents. For example, they were mentioned in the text of the Treaty on the Non-Proliferation of Nuclear Weapons of 1968. And in 1976, the United States signed a special Treaty with the USSR on Underground Nuclear Explosions for Peaceful Purposes.

Although the USSR received nuclear weapons later than the USA, it tried to keep up with its overseas rival. Including in the use of peaceful atoms. Thus, back in 1949, after the testing of the first Soviet nuclear bomb, the USSR representative to the UN Andrei Vyshinsky said that nuclear weapons would be used for the country's economic needs.

The development of atomic energy generated great enthusiasm in the world and in the USSR. Scientists sought and found the most unusual applications for it: from ships and cars with nuclear reactors to spacecraft and climate control.

## The time of great achievements gave rise to hope that the negative effects of radioactivity would be overcome. Proponents of peaceful nuclear explosions, for example, were famous Soviet physicists Vitaly Ginzburg and Andrei Sakharov.

Already in 1950, Stalin ordered a study of the possibility of using atomic energy "for peaceful purposes." In the early 1950s, physicists Georgy Flerov and David Frank-Kamenetsky, who worked in the closed city of Arzamas-16, proposed creating an artificial deposit of uranium-233 isotopes using an underground atomic explosion. The energy of the bomb, according to the idea, was supposed to heat the rock, simulating a geothermal source and forming the necessary material. However, all work in this direction did not progress and was classified.

The Soviet leadership and scientists returned to the idea of peaceful nuclear explosions only in the early 1960s. At that time, the USSR was actively developing new territories, conducting large-scale construction, specialists were creating new types of charges, and the first underground explosions were being carried out at testing grounds.

The Minister of Medium Machine Building (a secret department that managed the atomic project) of the USSR, Yefim Slavsky, played a major role in the development of the peaceful nuclear explosions program. In March 1962, nuclear physicists Yuri Babayev and Yuri Trutnev (both winners of prestigious Soviet awards and future academicians) submitted a report to him. It was called "On the need to develop work on studying the possibilities of using atomic and thermonuclear explosions for technical and scientific purposes."

Scientists have proposed using nuclear charges for blasting operations, oil and gas production, the creation of artificial deposits using the Flerov and Frank-Kamenetsky method, and to eliminate the gap with the United States in this area.

Slavsky met the idea with great enthusiasm and was able to put it into action. Thus began the secret Soviet Program No. 7 "Explosions for the Needs of the National Economy". The work was carried out by more than a dozen ministries of the USSR: medium-sized machine building, gas, oil and coal industries, energy, non-ferrous metals, water management and others.

In a short time, underground explosion technologies and suitable devices were developed. The charges were usually lowered into wells (called "combat") to the required depth, after which they were isolated from the surface by filling them with concrete. Accordingly, the bomb had to be quite compact, withstand high temperatures, pressure and aggressive chemical effects.

Thermonuclear charges were used **for peaceful nuclear explosions in the USSR and the USA . They are considered to be "cleaner". Most of the energy of such bombs is released due to the thermonuclear fusion reaction. Unlike the fission reaction, it does not leave radioactive remains (they are called "fragments"). This allows to reduce pollution of the environment, but not to get rid of it completely . After all, even the "cleanest" thermonuclear bomb (up to 99% of energy due to fusion) uses a "fuse" based on fission.**

## In addition, some deep-blast explosions used conventional (i.e. military) charges rather than special charges.

More than 150 institutes and organizations participated in the work on the program, including:

- All-Russian Scientific and Design Research Institute (VNIPI) of Industrial Technology (Moscow);
- All-Russian Research Institute of Experimental Physics (Arzamas-16);

- All-Russian Research Institute of Technical Physics (Chelyabinsk-70);
- Academy of Sciences of the USSR;
- Radium Institute named after V. G. Khlopin;
- Institute of Biophysics of the USSR Ministry of Health;
- Institute of Applied Geophysics of the State Committee for Hydrometeorology and Environmental Monitoring.

Soviet documentary about nuclear explosions for economic purposes

Nuclear explosions were supposed to be more cost-effective and faster than conventional blasting operations, and to help solve problems that could not be solved in any other way. In addition, they were intended to help study the operating principle of atomic charges, the structure and seismic activity of the Earth.

## The USSR is reshaping nature

Program No. 7 was launched on a grand scale in the USSR. Nuclear explosions were used for a variety of and sometimes non-obvious needs. The work was carried out in the strictest secrecy, each explosion had a code name, and only in the second half of the 1990s did the details of these industrial testing activities become known.

### More water for the south of the country

The first explosion took place in January 1965 at the Semipalatinsk test site at the confluence of the Chagan and Ashchi-Su rivers in Kazakhstan. A charge with a capacity of 140 kilotons (140,000 tons of TNT equivalent, or about nine Hiroshima

bombs) detonated in a borehole at a depth of 178 meters. A crater 408 meters wide and 100 meters deep remained at the site of the explosion. In the spring, water from the river was released into the area, creating the artificial Lake Chagan. Several months later, another similar explosion was carried out at the test site, at the Sary-Uzen facility.

READ ALSO

**The Horrors of the Krenholm Manufactory:** How Alexandra Kollontai Became a Marxist

**RAPM, Roma and Count Orlov.** Why the "proletarian composers" of the 1920s fought against "gypsyism"

Such lakes were supposed to be used as reservoirs to solve the problem of water shortages in the southern regions of the Soviet Union. In Kazakhstan alone, about 40 such "nuclear" reservoirs were needed. Spring runoff was planned to be collected in the craters from the explosions. According to the designers, they were supposed to be preserved in the summer due to a small evaporation mirror and the melted edges of the funnels. The water was going to be used to irrigate fields and water cattle.

The Creation of Lake Chagan. A fragment from a documentary about peaceful nuclear explosions

Other plans for irrigating the southern steppes included a large-scale project to "turn" Siberian rivers. According to it, Soviet managers were going to send the waters of the Irtysh and Ob along the Pechora-Kolvin Canal from Eastern Siberia to

Kazakhstan. It was believed that this would prevent the drying up of the Caspian and Aral Seas.

### A 60-kilometer canal could be quickly dug using 270 nuclear charges.

In 1968, the technology for creating such a structure was tested at the Semipalatinsk test site (the "Telkem" facility). At a shallow depth (30-40 meters), engineers detonated several low-power charges (0.24 kilotons). A full-scale test was conducted in 1971 on the marshy soils of today's Perm Krai (the "Taiga" facility), where the canal was supposed to pass. Using three 15-kiloton charges, it was possible to create a trench 700 meters long, 340 meters wide, and 10-15 meters deep.

### However, despite the use of "clean" thermonuclear devices, radiation purity could not be achieved. Due to the shallow depth of these explosions, "fragments" of radiation fuel came to the surface .

A strong background radiation was generated above the objects obtained, and the water in them was hazardous to health. Thus, after the Taiga test, traces of radionuclides were found in Sweden. The US accused the USSR of not complying with the terms of the 1963 agreement. The specialists could not guarantee the purity of other such explosions. Therefore, work in this direction was stopped.

## More resources

Another important direction of Program No. 7 was to increase oil production using targeted explosions. The charge was placed at great depths near oil-bearing rocks. The shock wave from the bomb crushed them, and the high temperature softened the solid fractions, making it easier to extract the oil. The explosion itself, in theory, was completely isolated from the surface.

The USSR was the first in the world to carry out an explosion at an oil field. In 1965, three devices with a capacity of 2.3 to 8 kilotons were detonated at the Grachevsky field (the Butane facility) in the Bashkir ASSR (now the Republic of Bashkortostan). This increased production volumes by one and a half to two times. The experiment was considered successful, and the technology was used at six more facilities:

- in 1969 at the Osinskoye deposit in the Perm region (“Griffin”);
- since 1976 - at Sredne-Bobutinsky in Yakutia (Oka, Vyatka, Sheksna, Neva);
- in 1980 - again at Grachevsky (“Butan”) and at Yesi-Egovskiy in the Khanty-Mansi Autonomous Okrug (“Angara”);

- in 1985 - in Sredne-Balyksky in the Khanty-Mansi Autonomous Okrug ("Benzol");
- in 1981-1987 in the Perm region ("Helium").

Back in the USSR, nuclear weapons were used to create reservoirs for storing gas condensate, a liquid formed in the earth from natural gases. Containers for this hydrocarbon were created in underground deposits of rock salt. According to the technology, during an explosion, a sealed cavity is formed in them, the walls of which melt and then harden (glaze) together with radionuclides. Contamination is possible only if water gets into the reservoir. It can dissolve the salt and release radionuclides.

### Soviet testers tested the technology for creating gas condensate storage facilities at the Azgir nuclear test site in Kazakhstan.

The first industrial explosion of this kind was carried out in 1970 in the Orenburg region at the Sovkhoznoye (Magistral) gas field. The resulting cavity of 11,000 cubic meters was used for 11 years, and in 1993 the well was sealed. Similar objects were created at other Orenburg sites (for example, Sapphire), as well as at the Astrakhan (Vega series of explosions) and Karachaganak (Kazakhstan, Lira series) fields.

The USSR also tried using nuclear explosions to crush apatite ore in the Murmansk Khibiny. In the Kuelporr mountain range on the Kola Peninsula, two explosions were carried out (Dnepr-1, 2) in 1972 and 1984.

In order to prevent contamination of minerals, scientists for the first time used a system of directed waste removal using air into the burial chamber (about 85% of radioactive products went into it). The ore could be used after washing with water and weak acids from radioactive dust containing cesium-137 and strontium-90. In total, about 400 thousand tons of minerals were obtained. The experiment was considered successful, but it was not developed further.

## Nuclear Flame vs Gas Fire

As strange as it may sound, nuclear explosions were used in the USSR to eliminate major man-made disasters, namely, to extinguish fires in gas fields.

The technology was first tested back in 1966 at the Urta-Bulak field in Uzbekistan. The burning gas fountain there could not be extinguished by conventional means for **three years** . About 12 million cubic meters burned out every day: for example, that's how much the whole of Leningrad (St. Petersburg) consumed at the time. It was impossible to even get closer than 250–300 meters to the pillar of fire, which was as high as a 40-story building.

**Then they decided to "seal" the deposit with a nuclear explosion. Drillers made a channel for a 30-kiloton bomb that approached the gas well deep underground at an angle.**

A powerful explosion shifted the rock and literally crushed the well. The gas stopped coming to the surface and burning out.

Similarly, atomic charges were used in accidents at gas fields in Uzbekistan (the Pamuk facility) in 1968, Turkmenistan (the Crater) and Kharkov region (the Fakel) in 1972, and the Nenets Autonomous Okrug (the Pyrite) in 1981.

Extinguishing a gas fountain in Urta-Bulak

## Shaking the Earth

By the 1970s, another area of application of peaceful nuclear charges had formed in the USSR - deep seismic sounding. This is when artificial vibrations of the earth's surface are created with the help of explosions (any underground explosion causes an earthquake), which are studied with special recording equipment.

READ ALSO

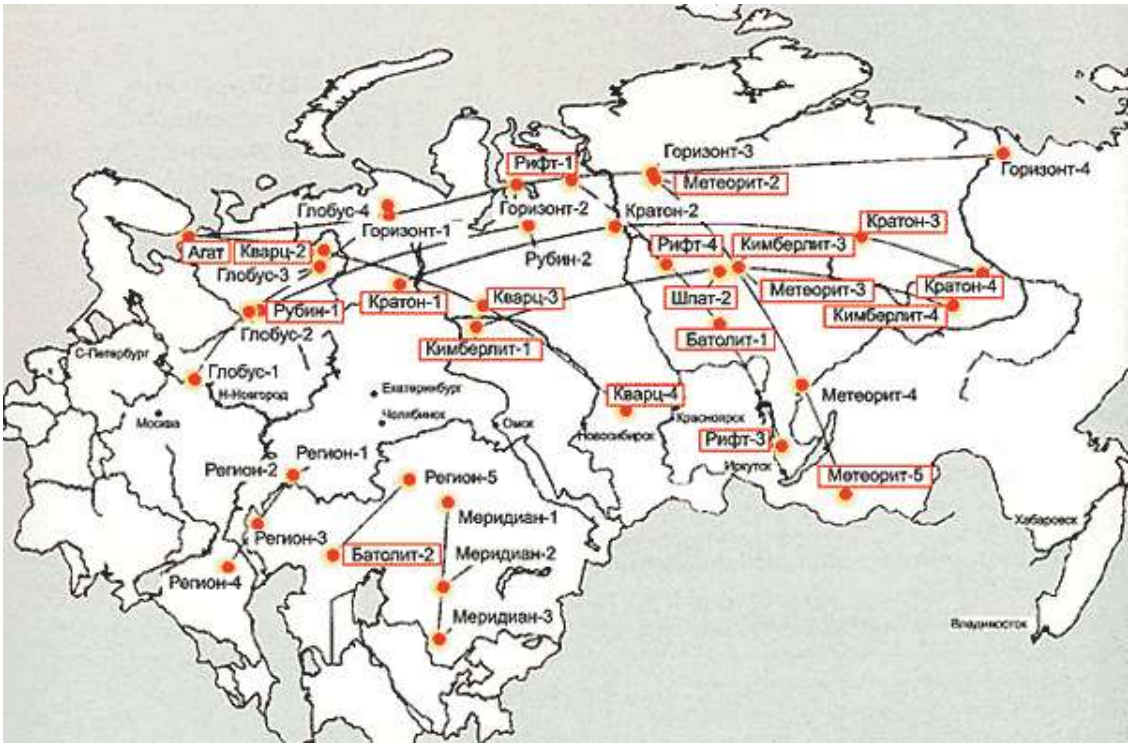
**Supervise and educate:** A brief history of censoring content for children

**"Noticed in melancholy and despondency":** how the Decembrists lived in Siberia

This way, promising places for mining can be found. The seismic signal from a nuclear explosion extends up to 700 kilometers, while from conventional explosives – only 20.

For its time, this was a breakthrough, albeit controversial, technology. With its help, it was possible to study an impressively sized territory in a short time.

**The atomic charge, placed at a depth of 500 to 1000 meters, made it possible to study the geological structure of the region over an area of 1500 to 4000 kilometers around the epicenter.**




Map of Soviet nuclear explosions for seismic sounding. Source: VNIITF

Probing with atomic charges began in 1971. In total, geologists studied 14 sites with a total length of 70 thousand kilometers. The existence of almost three dozen oil and natural gas deposits was discovered and confirmed.

## Underground landfills

The rapid development of heavy industry gave rise to the problem of storing and disposing of toxic waste. Above-ground tanks were expensive and required constant maintenance. It was impossible to dump large volumes of biologically hazardous materials into deep wells, from where they, in theory, could not penetrate to the surface and cause harm.

Then the idea of creating special containers using nuclear explosions was born. To do this, a charge was placed in a deep (up to two and a half kilometers) well. When it was blown up, a huge cavity was formed in the rock. It was supposed to pour waste into such voids.

The first such explosion was carried out in 1973 at the Kama-2 facility, not far from the author's hometown of Sterlitamak (Republic of Bashkortostan), 100 kilometers from Ufa. Wastewater from the local soda production began to be discharged into the resulting storage facility. A year later, the Kama-1 reservoir was created nearby (near the city of Salavat). Petrochemical production waste began to be pumped into it. As of 1997 alone, 28 and 1.5 million cubic meters of highly toxic waste, respectively, had been buried at Kama-2 and Kama-1 . Both tanks are still in use today.

The technology was considered promising and suitable for use in most of what is now the Russian Federation. However, such storage facilities were not created anywhere else.

The USSR also tried to create above-ground waste storage facilities using atomic explosions. In 1974, a 1.7-kiloton bomb was detonated near the enrichment plant in Yakutia (Kristall) to create a dam for toxic waste.

## Safe Mines

Also, with the help of nuclear weapons, miners tried to increase safety in coal mines. Work at such sites is complicated by cavities with gas, which are located in the depths under high pressure. The sudden opening of such cavities, for example during drilling, provokes a sharp release of large quantities of methane and coal, which is deadly for miners.

In 1979, at the Donetsk mine "Yunkom" (object "Klivazh") they tried to "collapse" such cavities with a nuclear charge. The calculation was that the shock wave would create multi-kilometer cracks in the rock and simultaneously open up gas voids. Five days after the explosion, the miners returned to work. The number and power of sudden emissions decreased. Another such explosion was planned, but it was not carried out before the collapse of the Soviet Union.

**In 1991, Mikhail Gorbachev signed a moratorium on nuclear testing. As a result, the programs for nine more explosions were curtailed . In total, 26–30 more objects were planned to be blown up by 1994.**

Some projects remained unrealized. For example, in the late 1980s and early 1990s, the idea of destroying chemical weapons stockpiles, reduced nuclear arsenals, and

spent fuel from nuclear power plants with atomic charges emerged. It was assumed that during an explosion, hazardous substances, along with the containers in which they were stored, would disintegrate into atoms or simpler molecules, and then harden in molten rock. The creators of the project believed that this would make disposal tens and hundreds of times cheaper.

The first experiment was scheduled for 1991, but was cancelled due to the moratorium. Radioactive and toxic waste began to be disposed of in a different way. For example, weapons-grade plutonium began to be processed into fuel for nuclear power plants, and the waste from the stations themselves was taken to special landfills.


Map of Soviet peaceful nuclear explosions for various purposes, except seismic sounding. Source: VNIITF

**In total, 124 peaceful industrial nuclear explosions were conducted on the territory of the USSR from 1965 to 1988 , of which only seven were at test sites. 80 objects were located in the RSFSR (48 in the European and 32 in the Asian part), 39 in the Kazakh SSR, two each in the Ukrainian and Uzbek SSRs, and one in the Turkmen SSR. Most often, explosions were used for seismic sounding, creating industrial capacities, and increasing oil production.**

**In some cases, several devices were detonated simultaneously: the total number of charges was 135 units, and their total power was 1.78 megatons, or 1780 kilotons: more than a hundred Hiroshimas. We can**

include here another 32 explosions carried out at testing grounds for technology and not considered industrial. In total, **156 peaceful nuclear explosions** were carried out in the USSR .

## Was it worth it?

There are conflicting opinions about Program No. 7. Although experts associated with the nuclear industry consider it successful and safe, some environmentalists and geologists harshly criticize peaceful nuclear explosions.

### Merciless radiation

If we are to believe the fourth volume of the work “Nuclear Tests of the USSR”, compiled by Minatom and dedicated specifically to Program No. 7, the radioactivity from peaceful nuclear explosions was 200 times less than that produced by all Russian nuclear power plants.

READ ALSO

**Love of Three Generations:** Alexandra Kollontai and the Debate on Prostitution

**Bulgakov, Vertinsky and the White Guard:** The Mysterious Life of Nina Nechvolodova

Nevertheless, radiation from peaceful charges was and will not disappear so easily. After all, even thermonuclear charges, which were mainly used for Program No. 7, as has already been said, cannot be completely clean.

### Relatively small sites (on average about one square kilometer in area and one and a half kilometers in depth) of peaceful nuclear explosions are in any case alienated forever.

Although underground horizons should filter out dangerous radionuclides, a small amount of them still reaches people sooner or later. Ecologist and academician of the Russian Academy of Sciences Alexey Yablokov even stated that radioactive gases from nuclear explosions can penetrate to the surface even from great depths.

Tritium is released in particularly large quantities during thermonuclear explosions (half-life is 12.3 years). Its radioactive products are not able to pass through human clothing and skin, but are dangerous when inhaled.

In addition to tritium, other radioactive isotopes are also formed during thermonuclear explosions. Some of them will decay only 100–200, or even 500 years after the explosion. Others, such as iodine-129 (half-life of 157 million years), plutonium-239 (240,000 years) or carbon-14 (57,300 years), will remain underground virtually forever.

Environmentalists also note that peaceful nuclear explosions can cause radioactive particles to enter groundwater and spread for hundreds of kilometers.

Exposure to even small doses of radiation over a long period of time increases the risk of developing cancer. As VNIIEF physicists claim in their book "Taming the Atom", all peaceful nuclear explosions were monitored by the Ministry of Health, Sanitary and Epidemiological Surveillance, and the State Committee for Hydrometeorology and Environmental Monitoring, and the employees and the population did not receive radiation above the established standards.

However, there has never been a systematic study of the health of those who lived and worked in the places where peaceful nuclear explosions were conducted . And some independent researchers have recorded abnormal incidence of some forms of cancer in such people. In general, it is still difficult to say how Program No. 7 affected the health of citizens of the USSR and the CIS countries.

## "Radioactive" lakes and dangerous wells

Some of the facilities under Program No. 7 were in disrepair.

According to the Ministry of Atomic Energy, only four peaceful nuclear explosions in Russia have caused contamination of territories: Kraton-3, Kristall, Taiga, and Globus-1. In another 24 places, 20–30 years later, “local” contamination remained. However, third-party data show that there were many more unplanned radiation emissions, both in the RSFSR and in other Soviet republics.

For example, the very first peaceful explosion of the USSR — "Chagan" — became one of the "dirtiest". During it, according to the Comprehensive Nuclear-Test-Ban Treaty Organization, a large-scale release of radioactive particles occurred . Their cloud covered nearby settlements and even reached Japan.

According to official data, the radioactive fallout, despite a design error (the bomb was not planted deep enough), was insignificant .

In any case, it was still impossible to use the lake for its intended purpose because of the radiation. Ten days after the explosion, the radiation 400–500 meters from the epicenter was about **one roentgen per hour** . This is 2,000 times more than the maximum permissible dose for humans **of 50 microroentgens per hour** . Measurements in 1989–1991 showed that the radiation level was still high: one milliroentgen per hour (200 times higher than the norm) in the crater and 500 microroentgens per hour around the lake.

## The lake itself had to be fenced off from the river with a dam to prevent the poisoned waters from flowing into the Irtysh basin and polluting the whole of southeastern Siberia.

Lake Chagan in a satellite photo. The old and new mouths of the Chagan River are visible at the top

Another reservoir at the Semipalatinsk test site, Sary-Uzen, also poses a radiation hazard. In 1992, a radiation level of 50 microroentgens per hour was recorded on its "shores."

The explosions under the Pechora-Kolvinsky Canal project were cleaner, but still not safe enough. After 15 years, the background radiation above the water-filled trench, which was nicknamed the Nuclear Lake, was from 50 to 600 microroentgens per hour. As of 2011, it fluctuates between natural and 80 microroentgens per hour. The idea of using atomic explosions in hydrology was abandoned in the USSR.

In 1971, a **nuclear accident occurred** at the Globus-1 seismic sounding facility in the Ivanovo region, just 360 kilometers from Moscow . The specialists working there improperly concreted a well. Because of this, after the explosion, a huge amount of gas, liquid, and clay contaminated with radionuclides came to the surface. Some of

this "good stuff" ended up in the Shacha River, one of the tributaries of the Volga. Several years later, when new wells were being drilled to check the facility, an even stronger release occurred.

The contaminated soil within a radius of two kilometers had to be literally removed by bulldozers and collected in special "barns". The dose reached **600 roentgens per hour** .

**The consequences of the accident at the Globus-1 facility made themselves felt many years later. Thus, in 2004, a bypass channel had to be built on Shacha and the banks had to be reinforced. In 2014–2015, another decontamination of the area was carried out here, and the wells were sealed.**

In nearby villages and towns the background is normal. Nevertheless , it is quite possible that radionuclides from the object are still getting into the waters of the region.

READ ALSO

**The best ice cream and the missing pipifax.** Truth and lies around two popular legends about everyday life in the Soviet Union

**The Story of the Kuril Ainu.** Interview with Ethnographer Marina Osipova

A similar accident in 1978 at the Kraton-3 facility in Yakutia was covered up. Only 12 years later did local geologists accidentally discover this one of the largest pollution incidents in Russia.

In total, according to Alexey Yablokov, the release of varying amounts of radionuclides occurred at 64 sites:

- “Azgir”, “Lira”, “Telkem - 1, 2”, “Sary-Uzen” and “Chagan” in Kazakhstan;
- "Angara" in the Khanty-Mansiysk Autonomous Okrug;
- "Batolit-1" in Krasnoyarsk Krai;
- "Butan - 1, 2" and "Kama - 1, 2" in Bashkortostan;
- the Vega series of explosions in the Astrakhan region;
- "Helium" and "Griffin" (series of explosions), "Taiga" in the Perm region;
- "Globus - 1-4" in the Ivanovo and Arkhangelsk regions, as well as the Komi Republic;

- "Dnepr - 1, 2" in the Murmansk region;
- "Sapphire - 1, 2" and "Magistral" in the Orenburg region;
- "Klivazh" in Donetsk region;
- "Kraton-3", "Crystal" and "Neva" in the Republic of Sakha (Yakutia);
- "Rift-3" in the Irkutsk region;
- "Takhta-Kugulta" in the Stavropol Territory.

## Not everything went according to plan

The assessments of the economic efficiency of the peaceful nuclear explosions program also vary greatly. It is practically impossible to calculate it objectively : the cost of the work is unknown due to strict secrecy, and no one has really assessed its feasibility.

Critics, despite the optimistic statements of the nuclear scientists, believe that the project was deeply unprofitable and the costs of Program No. 7 were **at least three times** greater than the profit.

Such estimates should be treated with caution. However, circumstantial evidence rather confirms them. It is enough to look in detail at the necessary costs of "cheap" nuclear charges. They had to be developed, assembled, prototypes tested at testing grounds, an individual application project developed, the bomb delivered to the explosion site, a suitable well drilled there, and then sealed and the facility secured. At the same time, it was necessary to pay for the work of personnel, and after some explosions, spend money and resources on eliminating accidents. These costs were usually not taken into account.

The picture becomes even sadder if you look at how many objects did not solve the tasks assigned to them, or even caused harm.

## Thus, only 89 peaceful nuclear facilities out of 124 are listed as closed, mothballed and under surveillance, that is, actually unused .

For example, Astrakhangazprom used gas condensate storage facilities (Vega facilities) for only four years. It quickly became clear that the cavities were not hermetically sealed and were smaller in volume than planned. The tanks were partially filled with destroyed rock, partially with water, which turned into radioactive brine. Now they are in a state of emergency. Two such chambers at the Karachaganak field in Kazakhstan also almost immediately failed , and the rest were practically not used. And 400 thousand tons of apatite ore, mined in Kuelporra

using nuclear explosions, remained lying near the field due to... "the absence of roads" to the mine.

According to Alexey Yablokov, contamination of minerals occurred at some deposits where nuclear charges were used . For example, at Gezhskoye (the Helium facility) there was so much tritium and cesium in the oil and underground waters that production had to be stopped. As a result, only 500 thousand tons of reserves were extracted from the potentially accessible 16 million tons. The development of the only gas deposit (the Takhta-Kugulta facility in Stavropol), where a nuclear charge was used, failed for the same reasons.

Yablokov also stated that in seven cases it was not possible to increase oil production by explosions, and the growth from the remaining 14 was only a few percent. At the same time, he emphasized that there is no objective statistical data on this issue.

## Nuclear scientists admit that oil contamination occurred at only one site – the Osinskoye field in the Perm region ("Griffin").

There, the oil industry workers, contrary to the plan, made a well in the center of the explosion, which caused radionuclides to enter the oil deposits and reach the surface.

It was not always possible to extinguish gas fountains with nuclear explosions. Two out of five such operations ended unsuccessfully. For example, in 1972, at the Fakel facility in the Kharkov region, due to incorrect calculations, the charge did not seal the well, but caused it to collapse. The fountain was eventually extinguished within a year using conventional means.

An even more unfortunate failure occurred at the Kumzhinskoye deposit (Pirit) in the Nenets Autonomous Okrug in 1981. While laying a channel for a bomb, the drillers missed the well by almost a kilometer. A powerful explosion of 37.6 kilotons produced no results. The fountain in Kumzha ejected two million cubic meters of gas per day for almost seven years (1980–1987).

The 1974 Kristall explosion in Yakutia, which was intended to create a dam for waste, was also unsuccessful. The bomb failed to raise enough soil, and the shaft turned out to be almost half the size of what was planned. At the same time, radionuclides were released. Subsequent explosions (eight more were needed for the dam) were abandoned, and an additional embankment had to be built in place of the first.

Finally, at the Yunkom mine (the Klivazh facility), a nuclear explosion was used to reduce the amount of methane emissions, but not eliminate them completely. Thus,

five months after the use of the atomic charge, a new emission occurred , killing two miners. Similar incidents occurred later.

## Obsolete technologies

Environmentalists do not consider explosions used to create drains for toxic liquids (Kama-1, 2) to be effective. In their opinion , simply dumping waste into the subsoil means fixing an outdated technology instead of developing low-waste or waste-free processing production.

However, the Kamas are given an extension of their use permits, even though their service life has expired. In the case of the Kama-2, this happened in 2014. The storage facility was allowed to be used for another 10 years.

Alexey Yablokov also called seismic sounding obsolete, citing data from geologists. Already in the 1970s, when the USSR was actively "probing" the earth's crust with atomic charges, new safer, cheaper and more accurate methods of subsurface exploration were discovered . The strangest thing is that most of the data obtained with the help of nuclear explosions **was never used** .

# The objects are old, but the problems are new

Many phenomena and processes associated with underground nuclear explosions remain unexplored . First of all, how they will affect the landscape and climate in hundreds and thousands of years.

**According to some studies , cavities covering radioactive remains of explosions become easily permeable. Radionuclides can penetrate through cracks and collapses, gaps and rusted places in wells. Explosions in salts could release natural gases, due to which radionuclides can rise with hydrogen sulfide and hydrocarbons, including to the surface and into underground waters.**

It is unknown to what extent all the features of the terrain were taken into account at the facilities. Many explosions were carried out outside the testing grounds in the field. Specialists had to navigate on the go. In such conditions, it was difficult to maintain radiation safety.

Some of the negative consequences have already manifested themselves . For example, radiation from underground has not gone away. Coming to the surface through aging structures, it forms stable, unabated radiation sources. Resources in

the places where explosions took place have become more difficult, if not impossible, to extract. In general, objects have become much less predictable.

Some of them may be dangerous if special work is not carried out. For example, since 2018, local authorities have stopped pumping water from the Yunkom coal mine in the Donetsk region due to a lack of funding. There is an opinion that flooding of the mine may lead to contamination of the Northern Donets River with radionuclides, and then parts of the Rostov region and the Azov region.

## The Groaning Earth

Another poorly understood problem with peaceful nuclear explosions is their impact on seismic activity. And this is not only the earthquakes immediately following the detonation of the charges, but also longer-term effects.

For example, ground movements - aftershocks. They can be felt at a distance of up to 3,000 kilometers from the epicenter of the explosion. In the two and a half months after the explosion, from 100 to 2,500 thousand aftershocks can occur, the energy of which can be higher than that of the original source.

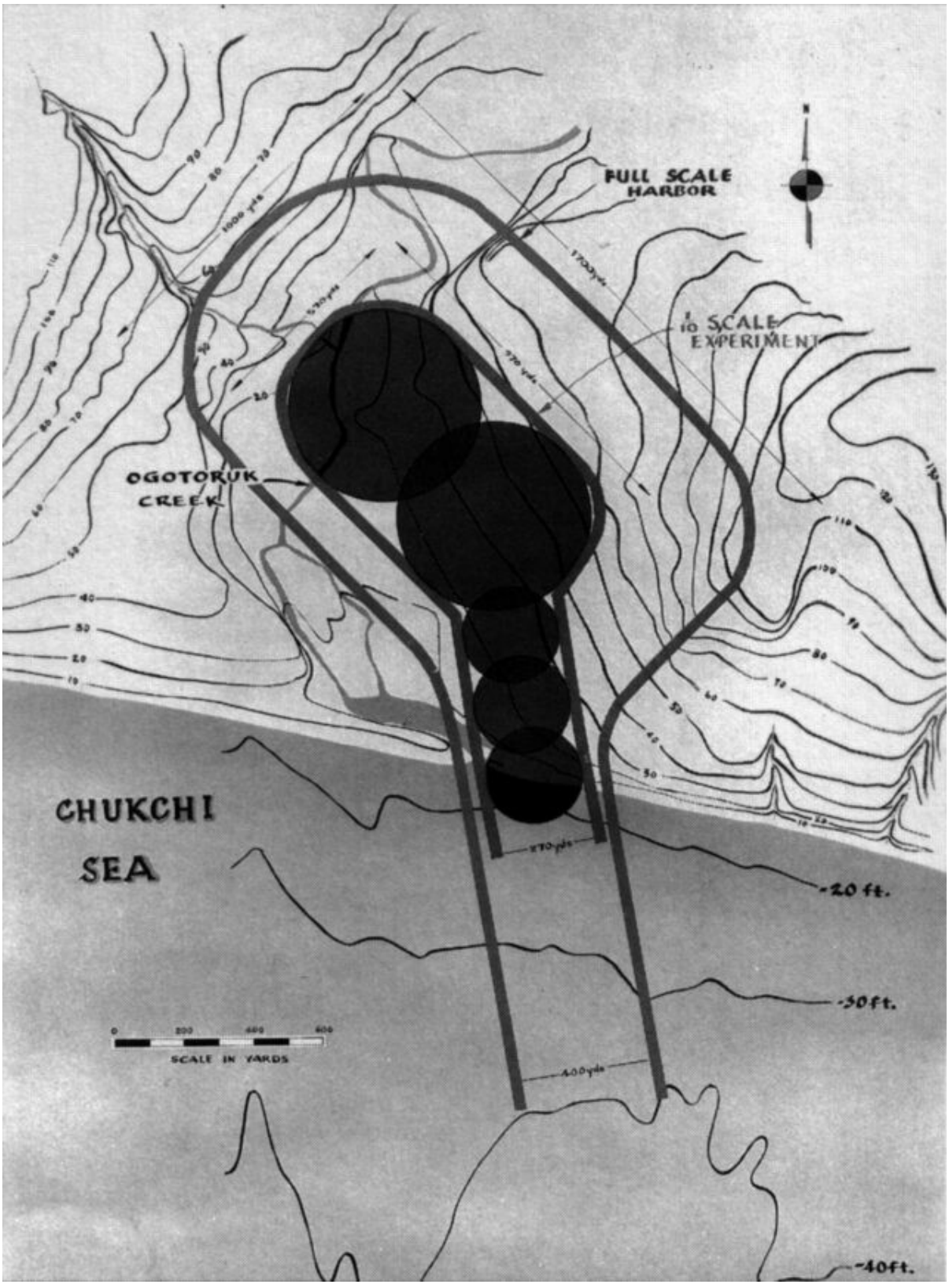
**Atomic explosions also cause slow waves (solitons) on the earth's surface. They spread at a speed of several tens of kilometers per year, do not weaken for a long time and can last for tens and even hundreds of years. The most unpleasant thing is that solitons can cause earthquakes thousands of kilometers from their epicenter many years later.**

In 1994, a conference held in Moscow under the auspices of the IAEA acknowledged that underground nuclear explosions could trigger earthquakes in the future. There is a theory that the tests on Novaya Zemlya increased seismic activity on the Baltic Shield (northwest of Eastern Europe). In addition, some researchers believe that underground nuclear tests are one of the possible reasons for the twofold increase in the number of earthquakes in the 20th century.

Explosions also permanently change the geological environment of the places where they were carried out: a 10-kiloton charge - within a radius of three, and a 100-kiloton charge - 30 kilometers. Thus, new cracks, faults and cavities appear in the earth's crust, part of the rock is crushed. This is fraught, for example, with the release of environmentally hazardous gases to the surface, such as radon and hydrogen sulfide, or oil spills. Sudden rock collapses in the places of explosions still occur.

## What's beyond the ocean?

In the USA, as has already been said, peaceful atomic explosions began to be carried out earlier than in the USSR. The plans of American businessmen in general did not differ much from the Soviet ones. With the help of atomic weapons they were going to create harbors, road embankments, canals, underground reservoirs, cut tunnels through mountains, stimulate the extraction of minerals, and study the structure of the Earth.



Alaska Harbor Project. Source

**Some American projects could easily compete with the Soviet gigantomania. Thus, in the 1960s, a project was considered to create a new canal through the Isthmus of Panama using atomic charges. It was supposed to carry out from 200 to 300 explosions over 10-14 years. And within the framework of one of the projects of the international program to create an artificial harbor in Australia, it was supposed to detonate 5 charges with a total capacity of 1000 kilotons in boreholes at the bottom .**

The Americans had their own failures. The explosion in Nevada as part of Operation Emery in 1970 created a crack in the Earth, from which flames and dust with radioactive particles burst out from a depth of 270 meters. 86 workers were exposed to radiation (a safe dose, according to the official version), and radionuclides were registered in other states. And eight years earlier, after the Sedan explosion (the USSR created the Chagan facility by analogy with it), one of the largest radioactive clouds in US history arose .

Photo of the accident at the Emery facility. Source

However, in general, the US program of explosions "for the national economy" turned out to be much more modest than the Soviet one. American scientists failed to prove the economic efficiency of the technology. The public and environmentalists spoke out against the program, it scared potential investors. From 1957 to 1973, **only 26 explosions** were carried out , and in 1977, the Plowshare project was closed due to lack of prospects. So, by ratifying the treaty with the USSR on peaceful nuclear explosions, the States, in essence, simply recognized that the Soviet Union could carry them out if it wished.

**In total , more than 2,000 nuclear explosions** were conducted worldwide , of which about 1,500 were underground . The USSR accounted for 715 uses of atomic weapons, of which 496 were underground. 124 peaceful explosions accounted for 13.9% of the total number and 25% of the number of underground Soviet nuclear tests. For comparison: in the USA, only 26 out of 1,056 (i.e. 2.6%) explosions were "peaceful atoms".

In the late 1970s, the heads of the USSR, USA and Great Britain discussed a treaty on the complete ban of nuclear tests and peaceful atomic explosions. But the parties failed to reach an agreement. The document was adopted only in 1996. The USSR, in the end, was the first to introduce a moratorium on nuclear tests five years earlier.

It has not been possible to completely ban nuclear tests and peaceful explosions. **Three countries possessing atomic weapons have not signed** the treaty on their comprehensive ban : India, Pakistan and North Korea. It is characteristic that the Indian government positioned its first nuclear explosion (Smiling Buddha) in 1974 as peaceful. India and Pakistan, states with an outstanding border conflict, conducted their last nuclear tests in 1998. The DPRK has conducted six tests since 2006. And two nuclear powers, **the USA and China, signed but have not ratified** the treaty.

Peaceful nuclear explosions may be back. Under the Comprehensive Nuclear-Test-Ban Treaty , delegations from countries meet every ten years for a conference. At that conference, representatives from any country can ask for an amendment that would allow that country to conduct peaceful nuclear explosions, as long as they are not used for military purposes.



**Leya Feynman**
11.06.2022, 16:44

The author should be fired. Unreadable nonsense...

Answer -6

**Gregory Winter**
06/15/2022, 06:43

A superbly written article with a lot of information. And from the point of view of style, purity of the Russian language - everything is also very good. Many interesting facts.

For me - as a geologist - it was very informative. I will recommend it!

Answer 3

**Victoria Pilipenko**
06/15/2022, 07:49

Very interesting article, learned a lot of new things. Thank you

Answer 3

**Renat Gareev**
06.07.2022, 19:36

What technologies were created before. In shock. It was not developed, and who knows, maybe it was worth it... Although, now you don't hear much about new technologies in the same oil production. They mainly extract using old methods.
I was impressed by the film about extinguishing a well.
Thanks for the article.

Answer 0

**Rost Vaskovsky**
03.01.2023, 19:15

Thank you, informative!

Answer 0

**#story** **#USSR**



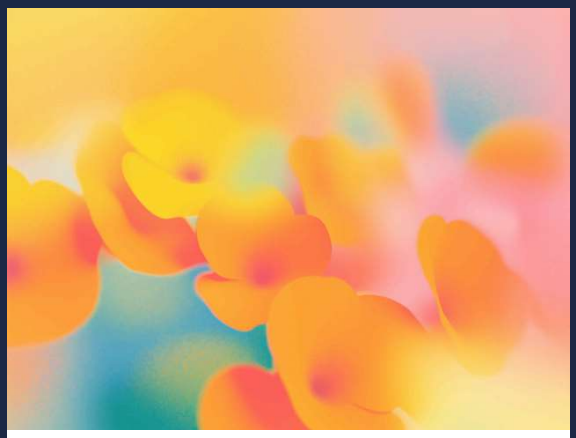
**The Arrest of Lev Termen:** Declassified Materials from the Case of the Repressed Inventor

**The police are looking for them:** criminals from the Great Patriotic War

**From Working-Class Europe to Revolutionary Russia and Back:** Alexandra Kollontai as a Politician

**Mikhail Pokrovsky:** Leader of Soviet History

**Inhabitants of our nightmares:** 9 mystical creatures that have superpowers



**How to Become Kinder in the New Year.** A Brief 7-Step Guide

Ksenia Antoshchenko • January 9

**In Search of the Lost Halva.** What Can You See in Forgotten Soviet Cinema?

Alexander Markov •
Oksana Stein • January 9

НОЖ

Daily reading of a smart person

Advertising
Contacts
Cooperation